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# A Comparison of Three Methods of Evaluating Manipulative Skill in Industrial Arts

Robert L. Thompson

# A COMPARISON OF THREE METHODS OF EVALUATING MANIPULATIVE SKILL IN INDUSTRIAL ARTS

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# INTRODUCTION

The industrial arts teacher who desires to evaluate student skill in performing manipulative operations with more objectivity and validity could use one or more of the following methods: (1) objective observation of the student's daily work; (2) evaluation of the finished project; and (3) manipulative performance test.

In this paper consideration is given to a description and statement of purpose for each of the above methods.

Under objective observation, progress charts, rating scales and anecdotal records will be discussed. The advantages of this method of observation are set forth, and the limitations noted.

Evaluation of the finished project is discussed with emphasis being placed on the rating scale as a measuring device. The advantages of this method are given. This method's limitations are listed.

The term "manipulative performance test" is explained and recommended procedures for using the test are given. Details are given for preparing a performance test, administering it and scoring it.

In conclusion, a comparison is made of these three methods for evaluating manipulative skill.

# I. OBJECTIVE OBSERVATION OF THE STUDENT'S DAILY WORK

## Objective Observation

Objective observation is a means of evaluating manipulative skill whereby the student's progress in his daily work is objectively observed.

In order that the instructor's observations be objective he should determine in advance exactly what he is going to observe. To determine what aspects of manipulative skill are going to be observed the instructor should examine the objectives he has set up for the course. These "items to be observed" should then be written down so that the instructor observes the same items in each student's manipulative performance. The more intense the preparation, the clearer the understanding of what is to be observed, the more accurate the final evaluation.[1]

The purpose of using objective observation as a method of evaluation is to obtain a more complete picture of the extent to which changes occur in the student's command of fundamental manipulative skills, and his understanding and ability to apply information relative to materials, tools, and processes.

The learning process is continuous; therefore,

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[1]Teacher Training Dept., The Armored School, Teaching Techniques in the Armored School, (The Armored School, 1943), 40.

evaluation should also be continuous.[1]

Means of Recording Objective Observations

In order to evaluate effectively the student's progress from day to day some type of progress chart or rating scale should be used. In this way the instructor can judge individual progress more accurately and fairly.

Finding time or taking time to record observations is one problem most instructors have in common. It is important, however, that observations made be recorded during the day or at the end of each day before the observations become hazy. The use of progress charts and rating scales will cut down considerably the time required to record observations.

One of the strongest arguments for keeping a daily record of observations is that if a record isn't kept the instructor will most surely be influenced strongly by the student's more recent behavior. For a grade based on observation to be considered valid it must be the result of recorded observation for the entire grading period, not just the last two weeks.

Progress Charts. - One method of providing a means for recording objective observations of student accomplishment in manipulative skill is the progress chart. On a progress chart the students' names are arranged in such a manner as to permit the instructor to check each student

[1]Roland Bacon, "Continuous Observational Testing," Industrial Arts and Vocational Education, 48 (March, 1959), 101.

against each of the operations listed.[1]

A progress chart may check only whether the student did or did not perform the required tasks, or it may show a record of how many times each task is performed. It could also be set up to record how poorly or how well a student performed each manipulative skill.

When using a progress chart, the chart must be constructed by the teacher for the particular course in which it will be used. In this way he can be sure the progress chart is evaluating exactly what it should. What to list on the chart is determined by the manner in which the course is conducted.

When indicating how well or how poorly the student performed each skill, from three to five levels of proficiency should be used to indicate the quality of the student's performance. These levels of proficiency might be indicated as follows: A. - outstanding, B. - excellent, C. - average, D. - minimum achievement, and E. - unsatisfactory. Another method for indicating proficiency levels would be the use of symbols for each level to indicate excellent average or unsatisfactory performance.

The progress chart is especially helpful to the instructor in determining which operations have been learned by the class and which need to be stressed further, and it can be adapted for use by the instructor as a record of operations he has demonstrated to the class. By display-

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[1]William J. Micheels and M. Ray Karnes, Measuring Educational Achievement, (New York: McGraw-Hill Book Co., 1950), 383.

ing the progress chart the student can observe his progress and strive to improve his standing on the chart.

The Rating Scale. - On a rating scale, recording is brief because much of the information to be considered when making the observation is printed on the form. The student is rated on how well the assigned manipulative skills were performed. This is done by assigning a numerical rating. The rating obtained when using a rating scale is based on a range or scale of possible ratings, the lowest rating on the scale corresponding to the minimum standard of achievement which is acceptable and the highest rating on the scale corresponding to the maximum standard of achievement.

In using a rating scale the instructor should rate all students on the same skills. The instructor should have a rating card for each student. While observing the student's manipulative skill he should sort the cards into groups representing high, average or low achievement. After sorting the cards, the instructor should re-examine his judgments to see whether any students should be reassigned to higher or lower ratings.

Anecdotal Records. - The anecdotal record is a descriptive record of objective observations made of the student's manipulative skill. The form on which the observation is recorded could contain only the date for the consecutive days of the month with a large space after each

day for the noting of observations. Significant observations are recorded either during the class period or immediately after, if possible. This record is then referred to when determining the student's progress.

The teacher who is beginning to write anecdotal records will find the following suggestions helpful:[1] (1) Start by selecting one or two students for intensive study. (2) Describe as many significant incidents each week as possible. (3) Do not try to interpret every incident. Make a summary analysis at convenient periods and look for developmental trends in manipulative skill. (4) Concentrate on describing those types of actions which you believe to have a bearing on the student's difficulties.

The anecdotal record will tend to increase the instructor's objectivity in evaluating the student's daily work by providing a descriptive record of his day to day progress.

Advantages

The advantages of using objective observation as a method of evaluating manipulative skill are as follows:[2]

1. The objective observation of a student's daily work provides a continuous check on the student's achievements. This enables the instructor to do remedial teaching before undesirable work habits become established. Close observation of the student by the instructor will prove an

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[1]Georgia Sachs Adams and Theodore L. Torgerson, Measurement and Evaluation For The Secondary-School Teacher, (New York: The Dryden Press, 1956), 186.

[2]Micheels and Karnes, op. cit., pp. 391-392.

incentive for improvement to the student.

2. Objective observation permits the teacher to check on certain instructional outcomes in a natural setting without losing instructional time or interrupting the learning process in any way.

3. The observation of a student's daily performance, if it is reliable and objective, should result in a more accurate measure of the student's ability to use and apply what has been taught than any other method of measurement.

Limitations

The major criticism of basing the evaluation of student achievement upon the observation of his daily work is not the method itself, but the fact that it relies so heavily on the judgment of the instructor. However, the real problem is not one of eliminating the instructor's judgment but that of increasing his objectivity.

Some of the common failings which tend to decrease the instructor's objectivity are:[1]

1. The instructor's failure to have clearly in mind what to observe.

2. Failure to consider major objectives of the course in determining what to observe.

3. Lack of clearly defined standards.

4. Failure to observe. Tendency to observe without paying attention to the detailed aspects of students' performance.

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[1] Ibid., pp. 373-374.

5. Tendency to give high ratings to students who appear to be busy without examining critically the quantity and quality of work done.

6. Tendency to let marks previously made by students influence current ratings.

7. Tendency to rate a given student the same on all factors considered.

8. Tendency to give all students in the class approximately the same rating.

9. Attempting to rate students on too many different factors. Trying to use a rating scale which is too elaborate and which calls for closer discrimination than an instructor can actually make.

10. Tendency to base evaluation solely upon either the most recent observations of the student at work or upon one or two striking and vivid instances of exceptionally good or bad behavior.

11. Tendency to give high ratings to "likable" students -- to students who have pleasing personalities.

12. Habit of waiting until reports are due and then hurriedly recording marks with little real, honest effort to evaluate achievement.

The faults listed above indicate the problems faced by the instructor who does not observe objectively.

## II. EVALUATION OF THE FINISHED PROJECT

### The Purpose of the Finished Project

The project is a means to an end. It is used by the instructor to develop certain desirable habits, skills, attitudes, and appreciations.[1] It is an instrument of instruction. A finished project may help an instructor evaluate the student's progress in the following ways: (1) Help discover the status of the learner in comparison with other students. (2) Check on teaching efficiency. (3) Motivate the learning process. (4) Diagnose pupil difficulties.

The purpose of evaluating the finished project is to obtain a more accurate judgment of the student's manipulative skill.

### The Use and Construction of a Rating Scale

The things to be evaluated in the finished project should be nearly the same as the objectives the instructor has in mind when he encourages the students to construct projects. These objectives are: selecting a good design, making plans for its construction, and executing the plans.

There are several items which are helpful in evaluating student achievement through projects. The teacher should examine the course of study to select factors for

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[1]Ibid., p. 398.

evaluating projects which will give an indication of student achievement in manipulative skill. Having done this, he should then group these items into classes according to the method of rating to be used. The teacher should place the items into a rating device in such a manner that each part of the project can be rated and all ratings combined. A complete, concise set of directions for the rating system should be prepared and used at all times.

Some teachers believe it is good idea to let the students assist in evaluating the project. One reason for this is that it eliminates argument. The student's checking for good workmanship and scoring for commercial acceptance are activities that contain definite instructional values.[1]

Rating Scales. - Although the results obtained from rating scales are usually low in reliability, they do call to the attention of the instructor and to the student as well, detailed aspects of the student's achievement.

The following suggestions should prove helpful to instructors in constructing rating scales to be used in evaluating manipulative skills which result from the designing, planning and completion of projects:[2]

1. The more limited and restricted the course, the more specific can be the rating scales designed for use in the course.

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[1]Archie E. Thomas, "Evaluating and Reporting Industrial Arts Pupils' Progress," Industrial Arts and Vocational Education, 42 (May, 1953), 148.

[2]Micheels and Karnes, op. cit., p. 406.

2. While the work performed by students in connection with projects may be a major part of the course it is not the only activity conducted and doesn't necessarily achieve or contribute to the realization of all the objectives of the course.

3. To determine what items should be included in the rating scale, make a list of the specific objectives of the course to which the finished projects contribute and with these objectives in mind make an analysis of the aspects of the work done in designing, planning, and completing projects.

4. If emphasis is placed upon the designing and planning of projects as well as upon the procedure followed and upon the completed project, these four phases of work would be logical divisions in the rating scale.

5. If the rating scale is to be used for the purpose of converting evaluations to a numerical basis, then each item should be designed to permit numerical ratings.

6. Generally the same system of indicating values should be used throughout the scale.

Advantages

There are several advantages in evaluation of the finished project as a means of determining the student's manipulative skill. It may help the instructor discover the ability of the student in comparison with other students. It enables the instructor to check on his teach-

ing efficiency and to motivate the learning process. And, it helps the instructor diagnose pupil difficulties.

Limitations

There is, however, a fallacy which comes into focus when one bases evaluation of manipulative skill almost entirely on the quality of the finished project. Even though the finished project is of high quality the student may have committed any one or all of the following:[1]

1. Consumed an unjustifiable amount of time in the completion of the project.

2. Asked for and obtained more assistance from the instructor and from his fellow students than any other member of the class.

3. Wasted an undue amount of materials.

4. Performed inaccurate and faulty work which was concealed when the project was assembled.

5. Abused tools and equipment; failed to use them properly.

6. Persistently violated safety rules.

7. Failed to follow the general procedure as initially planned.

8. Failed to accept the challenge to design a project of his own or even select and adapt a design but waited for the instructor to assign him a design to execute.

9. Showed no evidence of having developed an appre-

[1]Ibid., p. 399.

ciation of good design and skilled workmanship.

10. Failed to learn the related information about tools, materials, and processes which was assigned as a part of his project.

If in evaluating the finished project the above things can be committed and yet overlooked then it cannot be considered as final evidence of the development of manipulative skill.

## III. MANIPULATIVE PERFORMANCE TEST

### Description of Manipulative Performance Test

A manipulative performance test is a test designed to measure how well the student can do or perform a given piece of work. He is required to do something under controlled conditions while the speed and accuracy with which he performs the task are checked objectively.[1]

The instructor carefully observes the performance and records his observations on a previously prepared check list. A record is made of the precision and accuracy with which the student works; errors in procedure are noted and checked; the application and observation of specific points and safety precautions are recorded; and the completed work is carefully measured and checked.

The performance test provides the basis for a thorough analysis of the entire performance and an evaluation of each element in that performance.[2]

The major purpose of the performance test is to evaluate individual differences in manipulative skill. However, there are other pusposes of performance tests which are important. They are used to diagnose difficulties in performance. This enables the teacher to

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[1]The Armored School, op. cit., p. 34.

[2]Micheels and Karnes, op. cit., p. 326.

recognize and correct teaching deficiencies. Performance tests are useful as teaching aids. They motivate the student by revealing success or failure in the performance of a task. Performance tests also provide a satisfactory criterion for the evaluation of manipulative skill.

Recommended Procedures for Using Performance Tests

1. Preparing the Test. - The validity of a manipulative performance test will depend to a large extent on the tasks which are chosen to be included in it. When selecting the tasks to be included in a performance test, you should consider such factors as objectives of the course, time, amount of equipment and the number of students who can be effectively tested.

The first step in the development of a performance test is to make a careful study of the specific skills and abilities involved in activities the test is to measure. This is commonly termed "job analysis".

The next step in performance test construction is determining which of the operations or skills described in the job analysis are to be tested. In selecting these from the job analysis the follwoing criteria are suggested. The items should:[1] (1) Represent the whole performance as accurately as possible. (2) Be crucial in nature and have widespread effect on the quality of performance. (3) Re-

[1]James M. Bradfield and H. Stewart Moredock, Measurement and Evaluation in Education, (New York: The Macmillan Company, 1957), 341.

flect the emphasis given in instruction. (4) Embody the dimensions that meet the essential conditions of measurability. (5) Require minimum time and expense.

After it is decided what abilities are to be tested it is necessary to determine whether the performance of the task itself, or some product of that performance should be evaluated. A still better method might be to rate the product at the end of each of various stages in its production.

In setting up the specifications for a test, it should be kept in mind that time is an important consideration in performance testing. The performance test should be completed in one class period, and if all the students are not able to take the test at one time, determine what they are to be doing while awaiting their turn.

As wide as possible a coverage of the basic skills revealed in the job analysis should be sought.

Having selected a series of tasks or qualities to be included in the performance test, the next procedure is to determine the features of the performance or of the product which are to be rated, and devise a suitable rating form.

The rating form may consist merely of a listing in correct order of the operations which must be carried out to perform the job assigned, with space to check whether or not each operation was performed correctly. If the

time required to perform the task is important, this may also be recorded and used in scoring of the test.

Before developing a plan for administering the performance test, an account should be taken of the various factors or situations which might impose limitations. These restrictions are likely to be concerned with such factors as time, equipment, and number of students to be tested.

The next procedure in developing a performance test is to organize the data and materials -- to formulate an operating plan. Numerous trial runs of portions or all of the test may be required to establish suitable time allowances, adequate instruction, feasible means of judging certain aspects of performance, etc. The trial runs may suggest improvements which need to be made in the construction of the test.

After the test has gone through at least one trial administration and revision, it is ready for use. Then a complete set of directions should be prepared. The directions are very important. A complete detailed description of the procedures, in manual form, will help to insure uniformity of conditions and procedures from one test administration to the next. The items to be included in detail in the directions would be the preparation of materials for giving the test, steps in conducting the test and how the test will be scored.

When writing the directions, be sure to use language and terms that will be understood by the students.[1]

2. Administering the Test. - Regardless of how well the test is constructed, the reliability of the results obtained depends to some extent upon the skill of the instructor who administers the test. If possible, the instructor should set up enough work stations and have enough assistant help to administer the test to all the students in the class during one class period. It is very important that conditions are the same for each student. Each should have access to tools and equipment of the same kind and condition.

Before starting the test, carefully read and explain the directions to the group to be tested and if possible make sure each student has a copy of the directions. Do not permit students who have already completed the test to discuss the test with those who are taking or waiting to take it. This would cause undue confusion.

If time is an important element in the student's score, make sure you record his time for beginning and finishing the test.

When the instructor notices a student is about to make an error which would prevent his completing the test, he should give him instructions for correcting the error and allow him to finish the test. However, the teacher

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[1]The Armored School, op. cit., p. 35.

should note this on the rating form.

3. Rating the Performance Test. - The student's skill in the performance of manipulative operations must be measured and analyzed by the use of testing situations in which both the instructor and the student place appropriate emphasis upon each aspect of performance -- speed, quality, and procedure. The well constructed manipulative performance test provides for the measurement of each of these important aspects of skill.[1]

The scoring of a performance test will depend upon the kind of skill being measured. Of course the three aspects of performance mentioned above are always considered important factors in scoring the test.

In the scoring of any test, the judgment of the instructor is involved. The instructor must strive to be as objective and fair as possible with each student.

## The Advantages of the Performance Test[2]

The performance test has the advantage of establishing clearly the learner's ability to use the skills which he believes or claims he is able to use. It prevents the learner who is inclined to "get by" through pretense or partial learning from making his way through the course on this basis. At the same time, it is an excellent diagnostic test, since, if properly given, it will reveal to the

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[1]Micheels and Karnes, op. cit., p. 329.

[2]Donald M. Kidd and Gerald B. Leighbody, Methods of Teaching Shop and Related Subjects, (Albany, New York: Delmar Publisher, Inc., 1955), 121.

student and teacher the particular places where the pupil is weak. The scoring of a good performance test can be so accurately done that the learner will know that his efforts have been fairly and impartially measured.

Some teachers avoid use of the performance test because they believe it to be difficult to plan and to give. It is true that, like any good test, a performance test cannot be developed on the spur of the moment. Yet, when such a test has been devised, it can be used over and over again with different pupils and classes. It is not the kind of test which must be kept secret in its details in order to be useful. There is no harm in having pupils know exactly what work they will be called upon to perform and what standards they will have to meet. In fact, this is a very desirable step in the learning process.

Some types of tests do not measure accurately the pupil's previous knowledge of the test items and the opportunity to practice or inform himself on these items.

Success in the performance test is achieved through previous practice, and knowledge of what performance will be required, only stimulates effective practice.

Limitations

The limitations of the performance test for evaluating manipulative skill are as follows: The test is difficult to construct and requires a lot of preparation. It is also difficult to administer due to the fact that possibly only

a portion of the class will be able to take it at one time. This creates the problem of outlining work for the students who are waiting their turn.

## IV. A COMPARISON OF THE THREE METHODS OF EVALUATING MANIPULATIVE SKILL IN INDUSTRIAL ARTS

Three methods of evaluating manipulative skill have been discussed in this paper. They all have a few limitations. However, this does not mean that the one with fewer limitations is necessarily better than the others. Each method has its distinct advantages and is extremely valuable as a means of evaluating manipulative skill. The instructor need not decide on one method in particular and use it exclusively.

Objective observation of the student's daily work is a very effective means of evaluating manipulative skill, whereas evaluating the finished project would not give you much objective information on what the student has done from day to day. The same is true of the manipulative performance test. It can't give results which indicate the student's day to day progress. However, the evaluation of the student's daily progress is not by itself a sufficient means of evaluating the student's manipulative skill.

Let us consider the other methods of evaluating manipulative skill. Evaluation of the finished project is the second method of evaluation discussed in this paper. Since most industrial arts courses involve the construction of some type of project, this provides a means for evaluating

manipulative skill. Evaluation of the project must be objective to be valid. Rating scales are used extensively for evaluating manipulative skill by rating the finished project. The main thing wrong with this method of evaluation is that the student may have done a number of things incorrectly during the construction of the project which are covered up when it is assembled. A possible solution to the problem would be to use still another method of evaluating manipulative skill.

The third method of evaluation discussed in this paper is manipulative performance tests. The manipulative performance test requires the student to perform a certain number of tasks under controlled conditions. The test may be set up to evaluate specific skills based on speed, accuracy and procedure.

It would appear that the most effective way to evaluate the manipulative skill of a student would be to use each of these different methods during the industrial arts course.

# REFERENCES

## BOOKS

Adams, Georgia Sachs and Torgerson, Theodore L. Measurement and Evaluation for the Secondary-School Teacher. New York: The Dryden Press, 1956.

Bradfield, James M. and Moredock, H. Stewart Measurement and Evaluation in Education. New York: The Macmillan Co., 1957.

Greene, Harry A., Jorgensen, Albert N. and Gerberich, J. Raymond Measurement and Evaluation in the Secondary School. New York: Longmans, Green and Co., 1954.

Kidd, Donald M. and Leighbody, Gerald B. Methods of Teaching Shop and Related Subjects. Albany, New York: Delmar Publishers, Inc., 1955.

Lindquist, E. F. Educational Measurement. Washington, D. C.: American Council on Education, 1951.

Micheels, William J. and Karnes, M. Ray Measuring Educational Achievement. New York: McGraw-Hill Book Co., Inc., 1950.

Newkirk, Louis V. and Green, Harry A. Tests and Measurements in Industrial Education. New York: John Wiley & Sons, Inc., 1935.

Silvius, G. Harold and Curry, Estell H. Teaching Successfully the Industrial Arts and Vocational Subjects. Bloomington, Illinois: McKnight & McKnight Publishing Co., 1953.

Teacher Training Department, The Armored School Teaching Techniques in the Armored School. For Knox, Kentucky: The Armored School, 1943.

Wilber, Gordon O. Industrial Arts in General Education. Scranton, Pennsylvania: International Textbook Co., 1954.

## ARTICLES AND PERIODICALS

Bacon, Roland "Continuous Observational Testing," Industrial Arts and Vocational Education, 48 (March, 1959), 101.

Bennett, Kenneth B. "Student Evaluation -- The New Way," Industrial Arts and Vocational Education, 48 (April, 1959), 124.

Mouser, Robert J. "Mark Those Projects Fairly," School Shop, 2 (October, 1960), 54.

Thomas, Archie E. "Evaluating and Reporting Industrial Arts Pupils' Progress," Industrial Arts and Vocational Education, 42 (May, 1953), 148.

Wahlstrom, Richard N. "Industrial Arts Project Evaluation," Industrial Arts and Vocational Education, 49 (October, 1960), 59.

# APPENDIX

"E X A M P L E"

PROGRESS CHART FOR TOOL OPERATIONS IN WOODWORK[1]

| | USING CROSSCUT SAW | USING RIP SAW | SURFACE PLANING | EDGE PLANING | USING TRY SQUARE | USING MARKING GUAGE | USING BACK SAW | GRINDING PLANE IRON | WHETTING PLANE IRON | USING BRACE AND BIT | DRIVING NAILS | USING WOODSCREWS | USING MITER BOX | FINAL | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Adams, John | | | | | | | | | | | | | | | | | |
| Allred, John | | | | | | | | | | | | | | | | | |
| Anderson, Fred | | | | | | | | | | | | | | | | | |
| Bachrack, Carl | | | | | | | | | | | | | | | | | |
| Crowder, Elmer | | | | | | | | | | | | | | | | | |
| Dawson, Arthur | | | | | | | | | | | | | | | | | |
| Dunkirk, Orman | | | | | | | | | | | | | | | | | |
| Eckley, Joe | | | | | | | | | | | | | | | | | |
| Eshlach, Walter | | | | | | | | | | | | | | | | | |
| Frek, William | | | | | | | | | | | | | | | | | |
| Jackson, Pete | | | | | | | | | | | | | | | | | |
| Johnson, Ray | | | | | | | | | | | | | | | | | |
| Kinnell, Frank | | | | | | | | | | | | | | | | | |
| Norden, Albert | | | | | | | | | | | | | | | | | |
| Olson, Harvey | | | | | | | | | | | | | | | | | |

[1]Emanuel E. Ericson and Kermit Seefeld, Teaching the Industrial Arts (Peroia, Illinois: Chas. A. Bennett Co., 1960), 228.

"E X A M P L E"

RATING SCALE FOR PROJECTS IN

BENCH WOODWORK COURSE [1]

Name: _____ Course: _____

Project: _____ Score: _____

Instructor: _____ Date: _____

Number of items which do not apply: _____

Directions: Each of the items in this scale is to be rated, if it applies on the basis of 4 points for outstanding quality, degree, compliance, or performance, 3 points for better than average, 2 points for average, 1 point for inferior, and 0 for unsatisfactory or failure. Encircle the appropriate number to indicate your rating. Draw a horizontal line through the row of numbers opposite each item which does not apply. Enter the total points earned under each major phase. Enter the composite total in the space at the top of the sheet. Also indicate the number of items that do not apply.

I. Designing Phase: (Total Points_____)

1. To what extent is the project designed or selected of value to him or to his associates? 0 1 2 3 4
2. To what extent did he evidence sensitivity to the elements of good design?
   A. Size, proportion, balance, relative weight of parts? 0 1 2 3 4
   B. Texture, color, surface and line enrichment? 0 1 2 3 4
3. Is the material selected appropriate? 0 1 2 3 4
4. To what extent did he adapt his design to take advantage of the strength, appearance, and working characteristics of materials specified? 0 1 2 3 4
5. To what extent is the design his own work? 0 1 2 3 4
6. To what extent did he seem to attach importance to the problem of selecting or evolving a design of high quality? 0 1 2 3 4
7. Was his initial design feasible with respect to:
   A. His ability and the time available? 0 1 2 3 4
   B. Cost, materials, and facilities available? 0 1 2 3 4

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[1] William J. Micheels and M. Ray Karnes, Measuring Educational Achievement, (New York: McGraw-Hill Book Co., 1950), 408-410

Appendix C

"E X A M P L E"

ANECDOTAL RECORD FOR INDUSTRIAL ARTS

_____
Name

Directions:
In the space provided, record observations that bear on the individual's development of manipulative skill. Do not evaluate, but describe. Avoid vague words such as good, strong, poor, etc. Enter statements of what happened, or what you saw.

September 10 --

September 11 --

September 12 --

September 13 --

September 14 --

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[1] James M. Bradfield and H. Stewart Moredock, Measurement and Evaluation in Education, (New York: The Macmillan Company, 1957), 53.

"E X A M P L E"

PERFORMANCE TEST: BENCH WOODWORK[1]

Name _____ Date _____

Class _____ Section _____ Instructor _____

Possible Score:
Time 100 Procedure 236 Quality of work 498 Total 834

Student's Score:
Time ____ Procedure ____ Quality of work ____ Total ____

Directions

A. To the Student:

1. Read these directions carefully: Study the drawand specifications for the job you are to perform. Obtain from your instructor an explanation of all directions which are not clear to you. Your instructor will tell you when to start to work.

2. The purpose of this test is to measure how well you can perform the basic operations included in the job described below. In completing these operations you are to follow the procedures demonstrated and taught by your instructor.

3. The amount of time required, the procedures followed, and the quality of the finished work will be considered in evaluating your performance. By completing the job in 30 minutes or less, you can earn a total of 100 points for time. Five points will be deducted for each minute required beyond 30. You must stop if you have not finished by the end of 50 minutes. You can earn 236 points by following the correct procedure in every detail. You will receive an additional 498 points if your finished work meets all standards of accuracy and quality. To obtain the highest possible score, follow the proper procedures and work as accurately and rapidly as you can. Plan to finish the test.

4. When the instructor tells you to start, proceed as follows:
   a. Leave the surfaces marked, "1," "2," and "3" as they are. Finish working the stock to dimensions. Finish surfaces 4, 5, and 6 by planing, and number them in the order finished.
   b. Lay out and cut the dado.
   c. Locate and bore the hole.
   d. Lay out, cut and pare the curve.
   e. Lay out and cut the chamfer.
   f. Turn in your finished work to the instructor.

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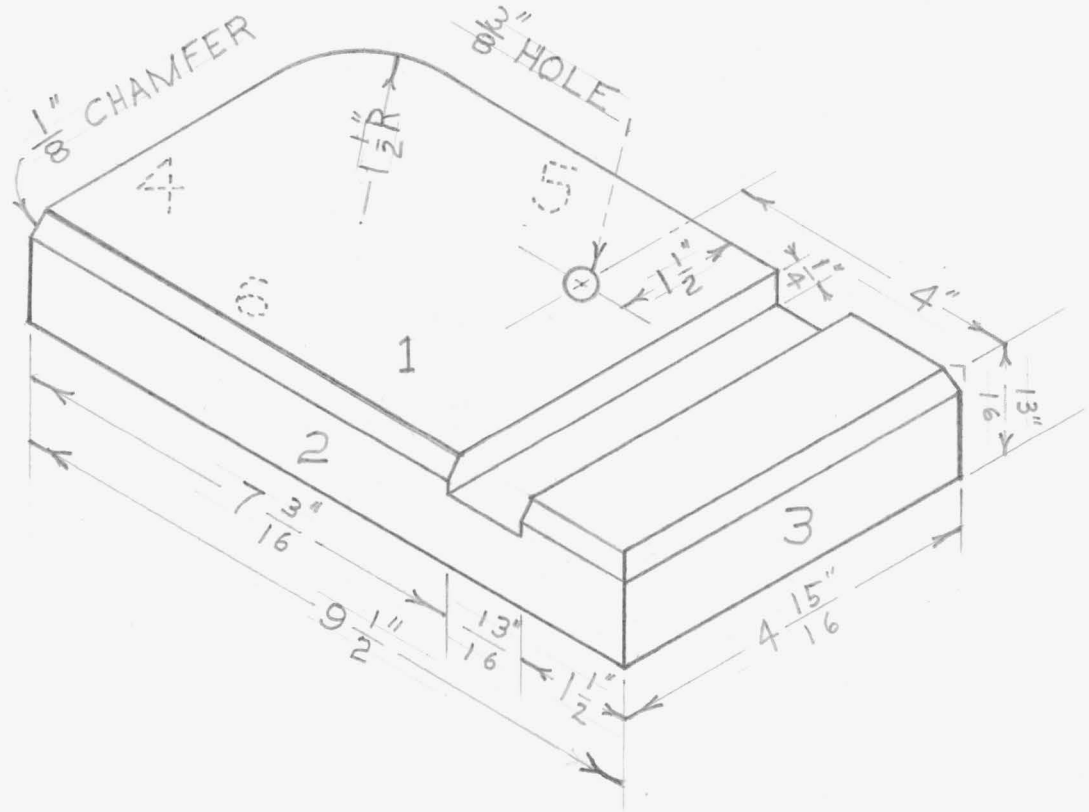
[1]Micheels and Karnes, op. cit., pp. 354-355.

Note: These directions and the drawing and specifications will be available to you while you take the test.

Specifications: To be made of straight-grain, plain-sawed yellow poplar, basswood, or white pine. Stock to be issued: 7/8" x 5 1/16" x 9 15/16", with surfaces 1, 2, and 3 accurately planed true, straight, free of wind, and 90° to each other. Saw, chisel, and plane cuts to be made to center of layout lines. No sanding permitted.




Working drawing and specifications for the test block